unknown causes. The structure of the swelling is characterized by spongy masses of parenchyma filled with starch and interspersed with woody layers.

An interesting myco-cecidia of the orange is described by FLORENCE HEDGES.[16] This cecidia is attributed to *Sphaeropsis tumefaciens*, nov. sp., which is described. The external characters of the gall are given, but the development and histology are omitted.—MEL T. COOK.

Phycomycetes.—PETERSEN gives an abbreviated English translation of his paper on the aquatic Phycomycetes of Denmark, which was originally published in Danish. The paper[17] is divided into three parts, the first dealing with the phylogeny and relationships of the Phycomycetes, the second with their occurrence and distribution, and the third with descriptive taxonomy.

As to their phylogeny, the author adheres to the view that the aquatic Phycomycetes and their near relatives constitute a phylogenetic series. If they were derived from the algae at various levels, they would hardly show the homogeneity which runs through the aquatic forms. As to the direction of their evolution, he holds that the lower Phycomycetes have been derived from the higher forms through reduction of the plant body. This view, which necessitates the assumption that motile zoospores and cilia were acquired by the degenerating forms, meets with difficulty when the non-aquatic Peronosporales are considered. The author regards the Pythiaceae, on account of their probable relationship with *Lagenidium*, as the ancestors of Lagenidiaceae. The Peronosporales, to which the Pythiaceae belong, would therefore form a part of the reduction chain, and it would be necessary to assume that zoospores adapted to aquatic conditions have arisen among the aerial Peronosporaceae from conidia eminently suited for aerial distribution. The alternate hypothesis that the Peronosporaceae are losing their aquatic characters in a dry habitat, instead of acquiring them, seems more reasonable. The chief argument of the author is directed against the view of FISCHER that the Phycomycetes are derived from the Monadineae. Here he rightly points out, among other differences, that the germinating zoospore of the Phycomycetes leaves the spore membrane behind, while in the endophytic Monadineae the zoospore makes its way in its entirety into the host cell. The author rightly regards the Synchytriaceae as a distinct group, which represents a line of development different from the rest of the Chytridiales. The idea is not fully carried out, however, in his synopsis of the families given later.

In the second part of the paper are given many interesting observations on the biology and distribution of the aquatic Phycomycetes in Denmark. The Saprolegniales occur frequently on fish and frog spawn, but they do not

[16] HEDGES, FLORENCE, *Sphaeropsis tumefaciens*, nov. sp., the cause of the lime and orange knot. Phytopathology **1**:63–65. 1911.

[17] PETERSEN, H. E., An account of Danish freshwater Phycomycetes, with biological and systematical remarks. Ann. Myc. **8**:494–560. *figs. 27.* 1910.

———, Studier over Ferskvands-Phycomyceten. Botanisk Tidsskrift **29**: 345–429. *figs. 27.* 1909 (with English abstract).

produce such epidemics among fish as have been reported in other countries. Dead twigs, which have fallen into the water near the shore, form the most common habitat for these fungi. They sometimes occur on remains of aquatic plants, like *Nuphar* and *Nymphaea*, but herbaceous plants do not generally seem to be a favorable substratum for their growth. Leaves which fall into the water in autumn are not a suitable subtratum. The lower forms frequently infect plankton crustaceans, which have not generally been regarded as hosts for these fungi. The most favorable time for the growth of the aquatic Phycomycetes is in early spring, while the water is still too cold to allow growth of bacteria and infusoria.

The rest of the paper consists of a taxonomic arrangement of the species, with notes as to their habits and occurrence. The brief descriptions which are given for the known species in the former paper are omitted in the translation, diagnoses being given only for the new species. Of these there are twelve. One, *Pythiomorpha gonapodyoides*, represents a new generic type. It is unfortunate that the designation "sp. nov." accompanies the names of these species in the translation. It is needless to point out the confusion that may result from such double publication of new species in editions appearing nearly a year apart.

The paper, which is an excellent achievement in local botany, shows the results which sustained study of a group may be expected to yield in territory of which the flora is presumably fairly well known. It is to be hoped that it may direct the work of botanists of other countries to this fruitful field.

According to a brief article by MAIRE and TISON,[18] sexuality usually attributed to *Urophlyctis* is lacking in that genus. In *Urophlyctis* empty cells are found accompanying the sporocysts, thus making it appear as if conjugation had taken place. These empty cells, however, according to the authors, are nothing more than the older vegetative cells whose contents have passed into the younger cells, which arise as buds from the older ones. The authors conclude that *Urophlyctis* should be classed with the Cladochytriaceae, the three genera, *Urophlyctis*, *Physoderma*, and *Cladochytrium*, forming a well-defined natural group.

LECHMERE[19] has described the abnormalities occurring in a species of *Saprolegnia* which he had under observation in pure cultures for a period of five months. The abnormalities, which frequently occur in laboratory cultures of these plants and some of which have been figured by several investigators, occur mostly in the sporangia, and cause these organs to assume forms and modes of behavior characteristic of other genera of the Saprolegniales. Variations are described simulating the sporangia of *Leptomitus*, *Pythiopsis*, *Achlya*,

[18] MAIRE, RENÉ, et TISON, ADRIEN, Recherches sur quelques Cladochytriaceae. Compt. Rend. **152**:106, 107. 1911.

[19] LECHMERE, A. F., An investigation of a species of *Saprolegnia*. New Phytologist **9**:305–319. *pls. 1, 2*. 1910.

Dichtyuchus, and *Aplanes* in form, manner of discharge, and germination of spores. A common type of variation is one in which chains of rounded sporangia discharging laterally are formed. It is well to have these variations recorded from observations on a single form in pure cultures.—H. HASSELBRING.

Photosynthesis in water plants.—BLACKMAN and SMITH[20] have published two papers upon "Gaseous exchanges of submerged plants," being nos. 8 and 9 of the excellent series on "Experimental researches on vegetable assimilation and respiration" issued from BLACKMAN'S laboratory. The first of the present papers deals with "A new method for estimating the gaseous exchange in submerged plants." Instead of using the oxygen elimination as the basis for study, the CO_2 consumed is determined. Water of known CO_2 content (determined by tritation) is passed over submerged plants of a given illuminated surface, and the CO_2 withdrawn for photosynthesis determined by later titration. Correction is made for CO_2 produced by respiration and for that in the eliminated gas. The method seems to insure reasonable accuracy.

In agreement with other workers, BLACKMAN and SMITH find *Elodea* extremely sensitive to adverse conditions. A few days of storage in tap water in laboratory or greenhouse cuts the assimilation 17 to 30 per cent. The plant also endures great concentration of CO_2. Water saturated from an atmosphere containing 30 per cent CO_2 does not interfere with assimilation; it is not likely that air plants would long endure such concentrations. The points of large significance can be set forth by quotations from the summary of the second paper:

"The aim of this study is to demonstrate the *nature* of the relation between assimilation and the chief environmental factors: (1) CO_2-supply, (2) light-intensity, and (3) temperature. The relation is such that the magnitude of this function in every combination of these factors is determined by one or the other acting as a limiting factor."

"The identification of the particular limiting factor in any definite case is carried out by applying experimentally the following general principle. When the magnitude of a function is limited by one of a set of possible factors, increase of that factor, and of that one alone, will be found to bring about an increase of the magnitude of the function."

"The experiments in this paper deal with such moderate intensities of assimilation as may be fairly well maintained for several successive hours. With more intense assimilation the values soon fall off by the action of internal factors grouped at present as the *time factor*. Experiments in which this additional factor has to be reckoned with will be considered in a later paper."

[20] BLACKMAN, F. F., and SMITH, A. M., Experimental researches on vegetable assimilation and respiration: VIII. A new method for estimating the gaseous exchanges of submerged plants; IX. On assimilation in submerged water plants and its relation to the concentration of carbon dioxide and other factors. Proc. Roy. Soc. London B **83**:374–412. 1911.